Infinitely Large Organic Solar Cell Modules: At The Edge Of Traditional Territories For Power Supply

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Infinitely Large Organic Solar Cell Modules: At The Edge Of Traditional Territories For Power Supply

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Abstract: The photovoltaic industry is on the cusp of dramatic transformations, as the proliferation of emerging technologies presents an unprecedented opportunity for their use in distributed generation, grid-connected and microgrids.

Organic photovoltaics (OPV) or polymer solar cells will only have a key role if they are designed and engineered to create sustainable and efficient power networks. Like many areas of innovation this technology has to play out at the edge of traditionally stable and well-understood territories.

One way is directing OPV research to fully solution processed devices, roll-to-roll printed and coated under ambient conditions. We are able to produce photovoltaic modules with literally infinite lengths of serially connected solar cell junctions. This is known as the Infinity-concept [1], where deliberate minimisation of the energy requirements has been made, both in materials and processes: no indium-tin-oxide is used, no vacuum steps are involved, only printing and coating steps are used. In addition, this processing that takes place directly on the barrier foil at low temperature and high speed [2].

The idea is ecodesigning OPV. A 1000 m2 solar park based on Infinity modules has been inaugurated at DTU and furthermore alternative forms of installations have been explored. Offshore and onshore based on light plastic structures have been built and designed [3]. These new concepts apart from being useful in energy production on a large scale, could potentially provide benefits as well on smaller scale and enable rapid and robust deployment in non-electrified and remote areas.

We will present the ecoprofiles of the different grid-connected OPV installations built at DTU, arrived at through life cycle assessment tools. The lighter and rapidly deployable systems have such an ultra-small cumulative energy demand that results in fast energy payback time <0.5 years. These levels outperfrom

traditional PV systems and show that smart OPV installations have a bright future potential for power supply.

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